Trails as Archetypes of Intentionality

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Abstract

Animal trails ought to be investigated as an archetypal Intentional phenomenon. A trail is Intentional in that it has significance beyond its immediate physical properties, and because the use of trails involves characteristic Intentional states: an animal must in some sense be seeking a destination, the animal must be able to determine which trail it ought to take, must be able to follow it, and must feel some urgency about staying on the trail.

Trails evolved along with the abilities to use them. Thus trails and trail-use are not just good exemplars of Intentionality: trails are an *archetypal* form of Intentionality. It is likely that in some animals there are special brain mechanisms for interacting with trails, and these mechanisms, devoted as they are to an Intentional phenomenon, can shed light on the brain's implementation of other aspects of Intentionality.

To understand the phenomenon of Intentionally we must look at as many exemplars as we can. Trails are especially worthy of study because they are external to individual animals, they are socially constructed and historically contingent, and their Intentionality subserves activity.

Introduction

The philosophical foundations of cognitive science rest on a commitment to naturalistic explanations of Intentional[1] phenomena. By "naturalistic" I mean that such explanations will make use of the theoretical vocabularies of the natural sciences, in particular of biology, and that the explanations will be justified empirically.

The phrase "Intentional phenomena" designates a constellation of concepts like 'representation', 'meaning', 'significance', 'content', and so forth, which apparently share an intrinsic relation to the mental: States like beliefs and intentions are often characterized in terms of Intentional phenomena; and it seems that only animals with minds can participate in activities or processes which involve Intentionality.

Intentional phenomena involve something more than straightforward physical cause and effect. For example the meaning of a representational token is, in principle at least, independent of any specific physical property of the token, or any specific physical relation between the representation and the thing represented. It is possible to create "meaningful" descriptions of things that don't exist.

Whether or not the phenomena mentioned above, and other apparently related ones, will ever be subsumed under some more general, and scientifically useful, notion of "Intentionality" remains to be seen. Our notions of Intentionality might be shown to be pre-theoretic confusions, ultimately to be eliminated by a scientific theory of the brain, or there may be a number of distinct phenomena, each analyzable on its own terms.

Much of the philosophical discussion of Intentionality has focused on an epistemological "representational" relation where one thing, the representational token, either designates, or expresses a proposition about, another thing. Examples of such representation relations are: noun phrases to their referents, declarative sentences to their truth conditions, pictures to the situations they depict, perceptual experiences to the objects that cause them.

I suggest that we need to enlarge our set of exemplars of Intentionality. For one thing, consideration of representational Intentionality focuses attention on the problem of the relation between a representational token and its meaning, while ignoring aspects of the physical instantiation of the token, or how the representations are used in activity. Consideration of other exemplars of Intentionality, especially ones which are apparently very little like representations, might enrich our intuitions, and help us understand how the different aspects of Intentionality are related.

[1] Following Searle (1983), I capitalize the words 'Intentional' and 'Intentionality' both to highlight their status as theoretical terms, and to differentiate them from the words 'intend' and 'intention' used to describe a purpose or goal or plan of action.

Trails

If you go out to the woods, you will encounter various kinds of animal and human trails. For the purposes of this paper, the central examples are trails made and used by large herbivores, for example: "deer runs," migration trails used by buffalo (Roe, 1970), caribou (Harper, 1955), and land tortoises (Van Denburgh, 1914). The members of many species use trails that have been in existence for several tens of generations, often longer. The human-made trail that you probably used to get out into the woods is also an example of what I will be discussing, but unlike animal trails, the human trail was probably designed and built intentionally.

Almost anywhere a large animal goes, it will leave some mark of its movement. It might knock down or trample plants, it could leave bits of fur or droppings or footprints or scent behind. Once the first animal passes through, the landscape may be changed enough for another animal to follow the first. The second animal could have various reasons for doing this: a carnivore might follow the track of potential prey; the first animal might have knocked fruit down from the trees; the second animal might recognize the first as a desirable mate, and so forth. Another reason for a second animal to follow the first is that the first animal's movement created a *clear path* through the woods — a route along which movement is facilitated.

I was careful not to use the term 'trail' to describe the situations in the previous paragraph because real trails and real trail use require more than just movement in a territory, even if that movement is based on the record of another animal's movement, or if the movement is along a clear path. It is important that an animal use a trail *as* a trail for its movement along that trail to be considered real trail use; only a route that is used as a trail should be considered to be a real trail.

In the use of trails as trails, the animal's being on the trail is a means towards its being at some *destination*. That is: the animal is not there because it is easier to find insects on the bare ground of the trail, or because it expects prey to pass by, or because it likes the sun. Instead, the animal using the trail is going somewhere, and following the trail is how to get there. Thus a preliminary requirement on trail use is that an animal must, at certain times, be properly said to somehow "have a destination," and that real trail use involves moving along the trail towards a destination. (It involves more too, as will be seen.)

To have a destination is to be in a certain Intentional relation towards some location in the terrain. In the terms of Searle (1983), the content of the state is such that the animal be at that location, and the state is potentially involved in the causation of the animal's movements towards that location. As such, it is a kind of "intention," however I think it worthwhile to consider this specific kind of intention on its own, as it seems possible for an animal to be capable of having destinations without also being capable of having intentions with other kinds of contents. Furthermore, the Intentional relation between an animal and its destination does not necessarily require any explicit representation of the destination in or to the animal.

Whether or not the members of a species are capable of having destinations is a matter for empirical determination. Bennett (1964) describes a number of kinds of experiments which could, in principle, be used to test if animals have specific Intentional states. In general, the experiments all utilize some sort of "divergence" — you set things up so that the animals will do one thing if they are responding to purely local features of their environment, and will do another thing if they are responding to the content of some Intentional phenomenon. As a very crude example: to determine if an animal is going to some specific place that happens to be uphill from here, you would move the animal to a location above its supposed destination. If it moves up, it is probably responding to the local features of the terrain; if it moves down, it might indeed be heading towards its destination.

For the most part, all of the members of a community of animals will have a very similar set of destinations: nesting areas, watering holes, places to gather food, and so forth. So further justification in attributing the destinations to the members of the community comes from both the observed fact of the animals congregating in those locations, and an understanding of the purposes served by their being there.

I will use the term *passage* to characterize an animal's movement towards its destination. Not all movement is passage, not even all movement that ends up at a destination. Passage requires having characteristic Intentional states, both the states involved in having a destination, and states involved with the movement towards the destination.

Finally, we can consider cases where an animal uses a particular route for passage from some point to a destination and leaves a mark of its passage. Other members of that animal's community, with the same destination, now arrive at the starting point. If these animals can tell that the first one went a certain way, perhaps by noting that its movement cleared out a path, or left marks that can be followed, they may use the same route. The next group's passage further marks the route, perhaps making it easier to find and

follow later. Thus a trail comes to be. And now the animals who are moving along its route are indeed "using the trail."

I summarize this discussion with a definition: *Trails are marks of passage used for passage.*

The Intentionality of Trails

In a very informal sense, the "significance" of a trail is more than its immediate physical manifestation, whether that be as a clear path, or as a collection of other marks of passage. However it is probably wrong to say that a trail has a specific "meaning" in the sense of a designation or a set of truth conditions. Although, while standing at one end of a trail, an animal may comprehend that the trail leads to some destination, this relation is not a matter of designation as much as it is a matter of a contract or promise: follow the trail and you arrive at where it leads. The significance of a trail has to do with the way it can be used.

Trails are most useful when the route to the destination is not obvious. If an animal can see (or smell or hear) its destination, and the way is clear, it can just go. True trail use is most necessary where the destination is far away, or the best routes to it are not immediately evident. A trail instantiates a nonlocal relation between the trailhead and the destination. An animal that can comprehend that relation is thereby capable of organizing its behavior over a vastly wider territory than one that cannot.

The Latin etymology of "intend" (and hence "Intentional") originates in a word meaning "to stretch out" or towards something. A archaic English meaning of the word referred to starting out on a journey. While the philosophical connotations of the word have since focused more on representation, it seems to me that we should recognize the insight captured by the initial metaphor. Intending to go somewhere, and starting out on a journey there, involve a characteristic relationship to the trail or road one is to use. And the trail literally "stretches out" to its destination.

One of the most recalcitrant problems in the understanding of Intentionality is the relationship between a representational object and its "content" — what it is about or what it signifies. This is especially a problem for internal mental representations and the external objects or situations they represent. With trails, the relationship is very simple and clear: if you follow the trail, you will eventually get where it goes. There is no "trail grounding problem" because the trail is right there on the ground. The simplicity of this relationship makes trails an especially important exemplar of Intentionality, both to highlight the fact that it is not always mysterious, and the fact that there are other aspects of Intentionality that demand equivalent attention.

One such issue is the "dialectical" relation that exists between a trail and the ground. Certain kinds of terrain support trails better than others, and a specific locale may support a trail in one place, or heading in one direction, better than others. (Due, for example, to erosion, the "lay of the land," differences in soil-types, in the ground cover, etc.) These preferences of the terrain to support trails may or may not coincide with the needs of the animals making and using trails. There is, in general, no reason that the natural processes of a region should conform to or respect the Intentionality of its fauna. As a region changes, for example with the appearance of new plant and animal species, or an altered climate, the requirements on, and the support for, the trails in the region will change. The pattern of trails will be a historically contingent compromise between the animals' needs and what the terrain will support.

There is a sense in which whatever Intentionality trails possess is derived from the Intentionality of the animals which use it, in a way similar to that in which the meanings of utterances in natural language depend on the Intentionality of their utterers. However the Intentionality of trails still deserves attention in its own right. As discussed above, the very existence of trails, as such, depends on their being created and used by animals capable of specific Intentional states. As discussed in the next section, the use of trails involves characteristic Intentional and emotional states. Of course interaction of an animal with just about any natural object will involve characteristic Intentional states. Trails are essentially Intentional objects because their physical properties are structured by the Intentionality of their users, and vice versa. The Intentionality of trails is a complex of relations among internal mental states and the external physical organization of dirt and twigs and grass.

Trails and the Evolution of Consciousness

I argued above that true trail use involves an animal's having specific Intentional states. Given the similarities in nervous systems among animals, there is some reason to suspect that humans and animals share some *conscious* states as they interact with trails. The capacity to experience these conscious states evolved along with the trails.

A crucial stage in the co-evolution of a trail and its user occurs when an animal is in some sense aware that the path it encounters is a trail — that it is a mark of the passage of a member of the animal's

species, and that it can be used for passage. Phenomenologically, this awareness includes the destination of the trail being "made present" at the trailhead, together with the trail's implicit contract to get the animal there. In addition, part of an awareness of the trail as such is an awareness of the passage of the other members of the animal's species who used the trail before.

This kind of awareness probably didn't appear instantaneously. It is likely that animals start following routes without being aware of them as trails at all. Over a number of years or generations, the herd might trample down the terrain, and each year, encountering the trampled terrain, choose to go that way again. Eventually these choices tend to focus on the aspects of the terrain which were caused by last year's passage, and the awareness of the previous passage, together with the awareness of the destination, begin to coalesce into an awareness of the trail as such. Some aspects of these subjective experiences are presumably grounded in neurophysiological states and processes, while other aspects are grounded in the social structure of the community.

Associated with the process of passage are a number of conscious states whose content may be glossed as an orientation to the question: "Which way do I go?" These states are related to the animal's understanding of its destination, and might include some awareness of its relative location. In the absence of a trail, the animal must navigate by using landmarks or whatever internal orientational system it has.

The situation is much easier when there is a trail. The animal now can focus its attention on the trail. The animal must have the ability to *follow* the trail. It must be able to detect it on the ground (or however it is marked). It must be able to coordinate its movement with the trajectory of the trail. It must be able to find the trail again if it loses it or leaves it for some reason. It must be able to decide among the choices that are presented by junctions in the trail.

It would seem that certain characteristic emotional states accompany the use of trails. For example animals probably feel a certain kind of comfort when they are solidly on the trail, when it is clearly the right trail, and when there are no problems with detecting the trail and making one's way along it. This comfort can be replaced by various levels of anxiety as recognizing or following the trail becomes more difficult, or as the arrival of a junction makes a choice urgent. In addition to problems associated with being lost, part of the comfort of being on the trail is that it is likely to be relatively safer than the surrounding territory. The anxiety associated with losing the trail is based on awareness of the loss of that safety.

These emotional states associated with trail use require an understanding of the trail as a trail. Part of the reason that a trail can be felt to lead to the right destination, and is safe, is that other members of one's species have gone there before. So the emotional experience of being safe on a trail, or being in danger off it, derive from the corresponding feelings about associating with the members of one's society.

Humans evolved into a world in which there were already trails. Other species had their own trails, as did the ancestors of the first humans. The Intentional, conscious, and emotional states associated with trails were already available to the earliest humans. This is why I think that trails are more than just good exemplars of Intentional phenomena: they are *archetypes* of Intentionality because both their existence in the world, and the Intentionality involved in their use, existed before humans even appeared, and thereby helped shape human Intentionality, with respect to trails, and, I suspect, other aspects of life as well.

However, as with just about everything else, the human species specialized, elaborated and transformed what it was given historically and genetically. In the case of trails, the next step was an explicit orientation to the trail as such. While caribou or buffalo might be able to *use* a trail as a trail, they never set out to build a new trail or to modify or maintain an existing one. As humans developed an understanding of their world, they began to understand the importance of trails, and developed some ideas about how trails work. Some of this understanding derives from problems associated with trail use: for example losing the trail, or figuring out where a trail goes. Activities can then be organized around solving these problems: for example marking the route of a trail or indicating its destination. Furthermore, the existence of a trail organizes human activity around and along the trail in addition to the use of the trail for passage. Thus settlements spring up along trails and near junctions, and the trail begins to be used as a feature of the terrain, for example to mark property boundaries.

Issues in the Natural History of Trails

So far as I have been able to tell, trails have been the subject of very little systematic study. Textbooks on "animal navigation" focus almost exclusively on the issue of whether animals possess "internal compasses" or some other means of detecting their location and heading, or if they use "cognitive maps" to figure out which way to go. (For example (Anderson, 1983).) Discussions of animal trails in the literature are relatively brief. Their presence and use is mentioned but almost never elaborated. One author who spends

some time discussing trails is Wilson (1975) who describes them as examples of "tradition," namely aspects of behavior that are passed on by learning as opposed to genetically.

Assuming it to be real, I don't know for sure what to make of this lacuna. It might be that the use of trails is felt to be just uninteresting. Or it may be further evidence of a Cartesian bias towards focusing on internal mechanisms to explain regularities in behavior. Furthermore, the attention that is paid to external aspects of cognition focuses on putative tool and language use, inspired perhaps by their importance in human activity. Yet in general the resources that underlie organized behavior aren't all in the heads of individual animals. And a naturalistic approach to Intentionality ought to consider examples of Intentional phenomena that humans share with other animals.

An ethological investigation of trails would pursue questions such as: How are trails created in a new territory? How do animals recognize the trails of their own species? When and why do animals make use of their trails? How do the trails in a terrain change over time? Associated with these questions are those about the sorts of perceptual and cognitive abilities that are needed to be able to follow a trail. Even if mammals possess sophisticated cognitive maps, those maps, and their utilization, can be properly understood only by taking the trails in the terrain into account. Lynch (1960), for example, in a study of people's spatial understanding of cities, found that their cognitive maps are structured around the most useful trails and landmarks.

Trails have been around long enough in evolutionary time for there to be special neural hardware to support animals' use of them. Is there any evidence that such hardware has evolved? And is there any evidence to suspect that this hardware was then used for other cognitive purposes? Spatial and travel metaphors are ubiquitous in thought and language. Is it possible that these metaphors are grounded in special purpose trail following mechanisms in the brain?

Implications for Cognitive Science

However interesting trails are by themselves, the point of this paper is that trails are important for what they illustrate about Intentionality in general. Several properties of trails make them important exemplars for a broader conception of the nature of Intentionality:

Trails subserve activity. Rather than involving any specific "designation" or "meaning," the Intentionality of a trail inheres in the way animals use it to get where they are going. Wittgenstein, in the *Philosophical Investigations* (1953) suggested, with his slogan of "meaning as use," that the Intentionality of language ought to be understood in the way that language use is a part of activity. While there are certainly examples of Intentional (and linguistic) phenomena for which strict designational meanings can be given, there are others where an analysis in terms of designations is, at best, strained. The primary importance of Intentionality is, I believe, its role in organizing activity, and trails give us a relatively simple example of an Intentional phenomenon intimately related to organized movement and activity, that does not necessarily include designational Intentionality.

Trails are physical and external. A great deal of attention in the philosophy of mind has focused on accounts of the Intentionality of internal mental states. The problem with such exemplars, especially given our current knowledge of neuroscience, is that the objects of discussion are inaccessible. Much human Intentionality, however, makes use of external, physical objects: tools, spoken and written language, ritual objects. And trails.

Norman (1990) develops the idea of "cognitive artifacts" — external objects or processes that assist in reasoning or memory or other cognitive tasks. Indeed a very general notion of "technology" would include physical objects that assist humans in all of their activity, whether it be physical or intellectual. Technologies exhibit complex relations among the properties of physical objects and processes, the mental states and processes of their users, and the social structures and relations that are enabled and necessitated by the technology. Although this honor is often claimed for fire, trails are probably the first "technology" any animal ever used,[2] and due to their relative simplicity, are a good place to start thinking about the Intentionality of technology.

The dialectical relation that a trail has with the ground is an example of an important aspect of human Intentionality which has received little attention. Many human social institutions exist in a similarly dialectical relation to the natural world in that certain physical or conceptual structures are relatively more stable or useful than others, for reasons having partly to do with brute physical reality, partly to do with human physiology and cognition, and partly (perhaps mostly) to do with the interactions among them.

Recent investigations into the "sociology of sci-

[2]As some of these ideas were developed at Xerox PARC, it behooves me to add that trails are also the first *documents*.

ence," for example (Latour and Woolgar, 1986), have been concerned with how this dialectical relation is manifested in scientific practice. On the one hand, the physical world will invalidate certain theories, because they predict things that don't happen. On the other hand, the physical world doesn't *determine* the form of the theories we deploy — that is a matter of individual cognition and social negotiation.

Trails are socially constructed. Much of the world that humans inhabit is constructed by humans. This is true of people's physical surroundings: buildings, offices, automobiles, even national parks; but is even more in evidence in the social realities that are created by human institutions: property, contracts, academic degrees, etc. Social reality, while often peremptory, is nevertheless a product of human activity. For a person to grasp a social fact is more than to just understand what is true about it, but is also to understand that the fact is at least in principle subject to negotiation. To participate in the network of meanings of social reality, one must understand (at least implicitly), the dynamics of that social reality, and the dynamics include its socially constructed nature (Heritage, 1984). Once again, trails offer a simple and observable exemplar.

Trails are historically contingent. The pattern of trails in a terrain is not specifically predictable even if you know the origins and destinations of the animals that live there. The original passages may have been influenced by any number of things, they may even have been random. But as the trail evolves with use and with its interaction with the ground, its route is modified and becomes more and more established. In general the local changes to a trail make sense, in terms of specific goals of the animals, or specific events in the terrain, but it is not possible to predict them.

As far as we know this is how languages evolve, at all levels, from phonology to semantics to pragmatics. Local changes can be understood as old forms are replaced by new ones, under the influence of new requirements, or cultural shifts of immigration or invasion. In general, the changes, and hence the properties of the result, can be understood only by understanding the history. I imagine that almost all complex Intentional phenomena share this property.

Conclusion

The pattern of trails in a terrain is a rich cultural artifact. The trails used by the members of a community record the activity of the community, and serve to organize that activity, which includes the construction, maintenance, and renegotiation of the system of trails, in addition to their use for passage. Thus trails are a valuable exemplar of aspects of Intentionality that are not as apparent in most of the oft-discussed examples. Yet even the standard examples, for example language, start looking much more like trails when they are viewed in their full complexity. It is crucial, if we are going to ever understand the nature of Intentionality, that we be open to as many different kinds of it as possible. Trails are relatively simple, relatively easy to observe, and they go everywhere.

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